



CURRICULUM

QA
14
C22
A3
A29212
1981

ALTA
510
1981
Gr10

CURRICULUM MATHEMATICS 1981 15

CURRGDHT

CURR

ERIM)

Alberta
EDUCATION

ACKNOWLEDGEMENTS

Alberta Education acknowledges with appreciation the contribution of the members of the following two committees operating under the direction of the Mathematics Coordinating Committee and the Curriculum Policies Board:

Mathematics 15/25 Development Committee 1979-80

Mr. Wilf Lencucha, Consultant, Alberta Education, Chairman
Mr. Richard Daly, Consultant, Alberta Education
Mr. Bruce Stonell, Consultant, Alberta Education
Mr. Garry Popowich, Associate Director of Curriculum

Mathematics 15/25 Program and Learning Resources Committee 1981

Mr. Bruce Stonell, Consultant, Alberta Education, Chairman
Mrs. Thelma Baumgarten, Teacher, County of Strathcona #20
Mr. Wayne Brenna, Dept. Head, Red Deer Public School
District #104
Mr. P.J. Clooney, Teacher, Edmonton Public School District #7
Ms. Carol Duffin, Teacher, County of Parkland #31
Mr. Hilgar Fast, Teacher, Calgary Public School Board
Mr. Walter Hubick, Teacher, Edmonton Separate School Board
Ms. Marlene Jones, Teacher, Calgary Separate School Board
Mr. J. Kieser, Teacher, Sturgeon School Division #24
Ms. Judith Loose, Teacher, Calgary Separate School Board
Mr. Herb Specht, Teacher, Camrose School District #1315
Mr. Garry Popowich, Associate Director of Curriculum

Cover Design &
Illustrations: Shih-Chien Chen

Typing: Carol Melnyk
Leslie Krueger
Daisie Pon

TABLE OF CONTENTS

| | Page |
|--|------|
| Mathematics 15-25 Goals | 1 |
| Mathematics 15 - Overview | 2 |
| Mathematics 15-25 Program Rationale..... | 4 |
| Guidance | 5 |
| Core - Elective Program | 6 |
| Problem Solving | 7 |
| Applications | 8 |
| Calculators | 9 |
| Mathematics 15 - Core | 12 |
| Text-Program Correlation | 21 |
| Mathematics 15-Electives | 24 |
| Electives - Other | 32 |
| Appendix | 40 |

Service Document Statement

This curriculum guide is interim in nature. The guidelines presented in this curriculum guide will be subject to revision according to information received from schools during the 1981-82 school year.

A final curriculum guide will be produced for Mathematics 15/25 when piloting has been completed. The complete program will be implemented as follows:

| | <u>OPTIONAL</u> | <u>MANDATORY</u> |
|----------------|-----------------|------------------|
| Mathematics 15 | September, 1981 | September, 1982 |
| Mathematics 25 | September, 1982 | September, 1983 |

NOTE: THIS HANDBOOK IS A SERVICE PUBLICATION ONLY.

The information is prescriptive only insofar as the content of the handbook duplicates that of the Senior High Program of Studies.

MATHEMATICS 15-25 GOALS

1. To develop in students a background in basic mathematics required in daily life situations
2. To assist students in developing problem solving techniques which are applicable to a variety of life situations
3. To revitalize the students' interest in mathematics through successful experiences at the students' level of understanding
4. To develop in students a knowledge of the development of mathematics, its application in our world both past and present and toward the future

MATHEMATICS 15 — OVERVIEW

Suggested
Time
Allocation

60%

Core

- A. Number System (Whole Numbers, Decimals, Fractions, Positive and Negative Numbers)
 - 1. Estimation
 - 2. Place Value
 - 3. Basic Operations
 - 4. Order of Operations
- B. Measurement
 - 1. Metric Measure
 - 2. Length, Area, Volume, Capacity, Mass, Pressure, Temperature
- C. Ratio and Rate
 - 1. Ratio and Equivalence
 - 2. Rate
 - 3. Percent
- D. Data Presentation
 - 1. Analysis of Data
 - 2. Tabulation of Data
 - 3. Construction of Graphs
- E. Algebra – Solving of Simple Equations
 - 1. Concept of an Expression
 - 2. Evaluation of Expressions
 - 3. Words and Algebraic Expressions
 - 4. Solution of Simple Equations In One Variable
 - 5. Simple Word Problems

Suggested
Time
Allocation

40%

Elective

A. Consumer Topics

1. Banking Services
2. Personal Salaries and Operating Costs
3. The Automobile
4. Budgeting
5. Travel and Recreation

B. Others

- E.g.,
1. Calculator Literacy
 2. History of Measurement
 3. Computer Literacy
 4. Pythagorean Theorem & Similar Triangles
 5. Graphing on a Coordinate Grid

MATHEMATICS 15-25 PROGRAM RATIONALE

RATIONALE

A strong foundation in the area of mathematics is important in the lives of young people. This would suggest that a diversified range of mathematics programs be available to suit the wide variety of abilities, interests and needs apparent in our high school students. Mathematics 15-25 is developed primarily to provide for approximately 25 to 35 percent of our student population who require high school credits in mathematics but have experienced frustration and difficulty in learning mathematics in the past. The program is not intended as a remedial program although it may be necessary to review and reinforce concepts and skills developed over preceding years.

Many of the students who enrol in this program possess the ability to achieve but may lack the motivation or interest to succeed to their fullest capacity. It is the responsibility of each teacher to arouse the student's interest and adjust the program to meet individual needs. The program should be success oriented, student centered and experiential. It should provide for a problem-solving approach, relying on applications that come in part from the student's knowledge and experience in the real world and should also make use of materials and activities to which the student can personally relate. For this reason, a core-elective program is provided with sufficient flexibility to meet these aims.

GUIDANCE

Mathematics 15-25 is a terminal mathematics program which accommodates the diploma students and/or those students who have experienced frustration and difficulty in learning mathematics. A major goal of this program is to attempt to develop in this particular group of students a basic background in mathematics to assist them in dealing with mathematics in daily life situations. The Mathematics 15-25 program is not a pre-requisite for attendance at technical schools or for enrollment in the Apprenticeship Training Program, but does assist students in preparation for apprenticeship training.

To be accepted in the Apprenticeship Training Program a student must be sixteen years of age and must have completed a basic minimum of education (completion of grade 9, 10, or 11) depending on the trade chosen. Mathematics 15-25 is generally not acceptable for trades requiring algebra and trigonometry. Students contemplating entry into trade courses are encouraged to study the trigonometry unit within the Mathematics 25 Geometry elective, and the Math 25 Power and Roots elective (being piloted during the 1981-82 school term).

An apprenticeship candidate may be required to write a prescribed entrance examination if there is any doubt regarding his mathematical level, or if the particular trade chosen requires an entrance exam. In the event of failure the candidate is encouraged to upgrade by applying for a pre-apprenticeship class, a correspondence course or an appropriate evening class.

Although completion of both Mathematics 15 and Mathematics 25 is desirable, pre-apprenticeship upgrading can accommodate individuals with incomplete grade 9 or lower levels of education.

CORE-ELECTIVE PROGRAM

The program is designed for approximately 60% of the instructional time available to be devoted to the core component with the elective component comprising the remainder. Both core and elective are mandatory components of the program.

The core aspect of the program is, in part, a sequential development or a review of the mathematics studied in previous years. It should provide the student with mathematics skills required in everyday life. The core is not detailed specifically, as a variation in student ability, and knowledge of mathematics will be present. Teachers should be flexible in dealing with the content of the core topics, the methodologies to be used and the breadth and depth of study undertaken so that the program may be more adequately adapted to meet the specific needs of the students.

The elective units may be used to extend core topics or to deal with mathematical topics and applications that are of special interest to students. These may include consumer topics, computer/calculator applications, history of mathematics and others that have been developed locally.

PROBLEM SOLVING

Problem solving is considered as one of the major goals of mathematics education. The ability to meet and solve the countless problems that arise in many subject areas and avenues of living is a fundamental skill of the schooling process

It may be recognized that certain forms of problem solving occur as a result of creative thinking. A more important form of problem solving in mathematics involves the development of a systematic and logical approach to deal with an unfamiliar situation in which no algorithmic solution is available. To develop this important ability involves the development and knowledge of certain process skills which the individual may draw upon to seek a solution. Problem solving crosses the disciplines and is fundamental to decision making.

The term common to this subject is "heuristic" meaning to discover. Heuristic is the science of discovery. Some refer to it as a strategy for teaching and learning. Heuristics is better identified as a collection of techniques for discovering solutions to problems. Many techniques are fundamental in the learning process of mathematics. What is important is the method of solution. Heuristics directs attention to the methodology which, in other words, indicates the "working process".

As in other skills, process is considered essential in problem solving and must be emphasized and practised frequently. (Refer to the Appendix section for a descriptive list of problem solving steps and strategies.)

APPLICATIONS

Mathematics, to be interesting and meaningful, must emphasize the application of mathematical skills and concepts to solve problems that are an everyday part of our life in society. Our task is to have students understand the interrelationships that exist between life problems and the mathematics program, and to be able to use their skills to the solution of new problems as they arise.

Applications, like problem solving, should be integrated into the overall program rather than be dealt with as an independent unit. Whenever possible, integration and coordination with other subject areas is important. When the area of applications becomes extensive or complicated in relation to computational skills, the use of the calculator may become a necessary component of the learning process to avoid time-consuming calculations and a lack of motivation resulting from the drudgery of the activity.

In searching for applications, teachers should identify sources of relevant applications in the community including the home, local industry and occupations and environmental sources. The use of real life applications not only will provide an awareness of problems within society but also is purposeful as a context within which to develop a more thorough understanding of mathematics.

Applications are important in unifying a variety of mathematical concepts in the program and should be considered as a necessary component of any unit of study.

CALCULATORS

"I have always endeavoured according to my strength and the measure of my ability to do away with the difficulty and tediousness of calculations, the irksomeness of which is wont to deter very many from the study of mathematics".

John Napier
From the Dedication of Rabbologiae

The calculator has become a fundamental instrument used in countless areas of human endeavor. The calculator should be considered not only as a computing instrument but also as an important teaching device. If used properly, the calculator will allow for the development of new instructional strategies and for students to focus on mathematical concepts and processes. The calculator is not a replacement for basic calculation or mental arithmetic which the human brain can do more quickly. However, when used in a proper manner the calculator can adequately reinforce basic skills and concepts, remove most of the drudgery from computation, allow for a more rapid solution of complex problems and eventually add new strategies for the instructional process.

Alberta Education encourages the use of calculators in Mathematics instruction. Their use can be justified by the following statements which were adapted from the list established by the National Council of Teachers of Mathematics Instructional Affairs Committee.

- The calculator can be used to encourage students to be inquisitive and creative as they experiment with mathematical ideas.
- The calculator can be used as an aid to assist the individual in making wise consumer decisions.
- The calculator can be used to reinforce the learning of the basic number facts and numeration concepts.
- The calculator can be used to develop or reinforce the understanding of computational algorithms and other mathematical properties.
- The calculator can be used to serve as a flexible tool to enhance estimation skills in computation.
- The calculator can be used as a resource tool that promotes student independence in problem solving.

- The calculator can be used to formulate generalizations from patterns of numbers that are displayed.
- The calculator can be used to decrease time taken to do lengthy calculations. Time and energy can then be redirected to the processes needed to solve difficult computations and problems.

Opportunity for extended use of the calculator in the Mathematics 15-25 program is provided in the elective unit on Calculator Literacy.

Teachers are also reminded of the "Guidelines For The Use of Calculators, 1-12" available from Alberta Education.

MATH 15

CORE

MATHEMATICS 15

A. Number System

Section A should be considered as a review for most students, and consideration should be given to the use of calculators in the development of concepts and skills.

PREVIOUS NUMBER SKILLS

| <u>TOPICS</u> | <u>APPLICATIONS</u> |
|---|---|
| 1. Estimation and Reasonableness of Answers <ul style="list-style-type: none">- In computation as well as problem solving | 1. Use of calculators 2. Vacation costs, living costs, education costs and benefits, building costs, repair costs 3. Problem solving skills 4. Games |
| 2. Place Value <ul style="list-style-type: none">- Multiplication and division- Powers of 10 | 1. Relation to metric system 2. Money notation 3. Writing cheques |
| 3. Basic Operations <ul style="list-style-type: none">- Whole numbers- Decimals- Positive and negative numbers- Single fractions | 1. Living expenses - food bills, rent, car payments, etc. 2. Banking services - deposit slips, cheques and balances 3. Insurance policies - homeowner, car, life 4. Income tax, monthly statements |

TOPICS

4. Order of Operations
 - Four basic operations
 - Use of parentheses
 - Application of the commutative, associative and distributive properties
 - Use of zero and one (concentrate on whole numbers for instructional purposes)

APPLICATIONS

1. Shortcuts in calculations
2. Math skill testing questions on cereal boxes, etc.

B. Measurement

TOPICS

1. Metric Measure
 - Selection of appropriate units

2. Length
 - mm, cm, m, km
 - Selection of appropriate units
 - Estimation
 - Measurement
 - Concept of and formulas for perimeter
 - Measuring instruments - ruler, trundle wheel, clipper, micrometer, odometer
 - Conversion - equivalent units within the SI system
 - Application to real world

3. Area
 - mm^2 , cm^2 , m^2 , km^2 , hectare
 - Selection of appropriate units
 - Estimation
 - Measurement-using a grid, calculation, formula
 - Conversion-equivalent units within the SI system
 - Application to real world

APPLICATIONS

1. Identify suitable units to measure real objects - carpet size, purchase of produce and other goods, medicine, shoe laces, etc.

1. Estimate and measure length of familiar objects and distance between objects

1. Estimate and measure area of familiar objects (books, desk, room)
2. Estimate area covered by finger, hand, shoe

TOPICS

4. Volume
 - mm^3 , cm^3 , m^3
 - Selection of appropriate units
 - Estimation
 - Measurement-using centimetre cubes, calculation, formula
 - Application to regular solids
 - Conversion-equivalent units within SI system
 - Applications to real world
5. Capacity
 - mL , L
 - Estimation
 - Measurement-standard and irregular containers
 - Conversion-equivalent units within SI system
 - Application to the real world
6. Mass
 - mg , g , kg , t
 - Selection of appropriate units
 - Estimation
 - Conversion-equivalent units within SI system
 - Application within real world
 - Development of relationship between mass, capacity and volume units
7. Pressure
 - Kpa
(brief introduction only)

APPLICATIONS

1. Measure small familiar objects
 2. Estimate and calculate volume of large objects
-
1. Build a cubic decimetre
 2. Estimate and measure volume. Relate to capacity
-
1. Measuring - use of balances, scales
-
1. Barometric readings
 2. Tire and oil pressure

TOPICS

8. Temperature
 - Celsius -°C
 - Identification of referent temperatures

APPLICATIONS

1. 30°C hot summerday:
150°C oven temperature

It is suggested that the History of Measurement Elective be incorporated into the Measurement Strand (as an introduction).

C. Ratio and Rate

TOPICS

APPLICATIONS

1. Concept of ratio

- As a fraction form for comparison:

$$\frac{\text{Circumference}}{\text{radius}}$$

- Notation: $\frac{C}{r}$ or C:r
- Development of equivalent ratios
 - from the concept of equivalent fractions
 - from similar triangles

2. Concept of rate

- Per unit form
e.g. litres per 100 kilometres, distance per hour

3. Percent

a) Concept of percent

- Fraction form - denominator 100
- Other equivalent fraction forms
- Discounts

- ##### b)
- Percents to decimals
 - Decimals to percents
 - Percents to fractions to percents

1. Mixture problems

2. Probability - odds
3. Energy consumption
4. Scale drawings
5. Shopping
6. Salaries
7. Sales costs

1. Circle graphs

2. Scale diagrams
3. Grading
4. Taxation
5. Other business and commerce examples
6. Media material (newspaper, ads, flyer)
7. Other real world forms
8. Forecasting
9. Other subject areas

D. Data Presentation

TOPICS

1. Interpretation and application of data from charts and graphs
 - Include pictograph, circle graph, bar graph
2. Collection and tabulation of data from environmental situations
 - From experiments
 - From industrial examples
3. Construction of pictographs, bar graphs, circle graphs, line graphs from data collected

APPLICATIONS

1. Newspapers, other media
 2. Sports and other subject areas
 3. Weather forecasts
-
1. School activities
 2. Population trends
 3. Ethnic groups
 4. Others
-
1. Data on school activities
 2. Data on social affairs
 3. Data on car sales
 4. Data on use of drugs, alcohol, etc.,
 5. Others

E. Algebra

TOPICS

APPLICATIONS

1. Concept of an Expression
 - identify specific algebraic terminology; constants, variables, terms and factors
2. Evaluating Expressions
 - substitution into simple expressions and formulas
3. Words and Algebraic Expressions
 - translate English expressions into algebraic expressions
 - translate algebraic expressions into English expressions
4. Solution of Simple Equations In One Variable
$$a + x = b$$
$$ax = b$$
$$ax + b = c$$
$$\frac{x}{a} = \frac{b}{c}$$
$$ax + bx = c$$

1. Science formulas e.g.
$$d=rt, E=IR$$
business formulas e.g.
$$i=prt$$
geometry formulas e.g.- area
 - perimeter
 - volume

5. Simple Word Problems

1. Practical problems in the fields of science, business and technology

TEXT/PROGRAM CORRELATION

If you have chosen "MATHEMATICS IN LIFE" as your text for Math 15, the following is a suggested outline that correlates the Math 15 Course Outline, Alberta Education, 1981, with text.

NOTE: The topics that are starred (*) could be considered as optional material.

CORE MATERIAL

Unit 1 WHOLE NUMBERS

- Ch#1 - Adding and Subtracting Whole Numbers
- Ch#2 - Multiplying Whole Numbers
- Ch#3 - Dividing Whole Numbers

Unit 2 DECIMALS AND THE METRIC SYSTEM

- Ch#4 - Adding and Subtracting Decimals
- Ch#5 - Multiplying and Dividing Decimals
- Ch#6 - The Metric System

Unit 3 FRACTIONS, MIXED NUMBERS AND PROBABILITY

- Ch#7 - Multiplying and Dividing Fractions and Mixed Numbers
- Ch#8 - Adding and Subtracting Fractions and Mixed Numbers
- * Ch#9 - Probability

Unit 4 RATIO, PERCENT AND STATISTICS

- Ch#10 - Ratio, Proportion,*Similarity
- Ch#11 - Percent
- Ch#12 - Statistics

Unit 5 ALGEBRA

- Ch#13 - Positive and Negative Numbers
- Ch#14 - Expressions and Equations

OPTIONAL MATERIAL

- Consumer topics are included throughout all of above units.
- Calculator exercises are included at the end of each unit.
- Ch#15 - Graphing on a Coordinate Grid

If you have chosen "MATH PLUS" as your text for Math 15, the following is a suggested outline that correlates the Math 15 Course Outline, Alberta Education, 1981, with the text.

NOTE: Those topics that are starred (*) could be considered as optional material.

CORE MATERIAL

Unit #1 WHOLE NUMBERS AND DECIMAL/MEASUREMENT

- Adding, Subtracting, Multiples of Whole Numbers and Decimals
- Metric Measurement - length, mass, liquid measure

Unit #2 FRACTIONS/GEOMETRY (excluding pages 40-41, 56-59, 60-61)

- Adding and Subtracting fractions and mixed numbers
- Multiplication and Division of fractions and mixed numbers

Unit #3 RATIO, PROPORTION, PERCENT/STATISTICS

- Ratio and Proportion
- Decimal, Fraction and Percent Equivalents
- % of a Number
- Sampling and Prediction
- Mean, Median, Mode
- Bar Graphs, Line Graphs, Circle Graphs
- Analysis of Data (pages 286-294)

Unit #10 NUMBERS AND EXPRESSIONS

- Positive and Negative Numbers-BASIC OPERATIONS
- Order of Operations
- Expression and Variables
- * - Expression with Exponents
- * - Words and Algebraic Expressions

Unit #11 EQUATIONS AND FORMULAS (Note: Section marked * could be considered as OPTIONAL)

- Solution of Single Equations by Adding, Subtracting
- * - Solution of Word Problems Using Equations
- Solution by Reciprocals
- * - Equations with Decimals
- * - Formulas
- Using Equations, Solving Equations
- Addition of Expression, General Solutions
- * - Applications and Solving Word Problems

OPTIONAL MATERIAL

Unit #4 INCOME

- Earnings (pages 102-111)
- Banking (pages 122-130)

Unit #5 CREDIT

- Credit Cards and Installment Buying
- Loans
- Home and Auto Loans

Unit #12 GRAPHING

- Points and Lines (pages 366-375)

MATH 15

ELECTIVES

Banking Services (Mathematics 15)

| <u>TOPICS</u> | <u>SUBTOPICS (areas of application)</u> |
|-------------------|---|
| 1. Bank Accounts | <ul style="list-style-type: none">- Savings- Chequing- Personal chequing- Chequing-savings- Service charges- Deposits-cheques- Bank statements- Interest - simple and compound |
| 2. Loans | <ul style="list-style-type: none">- Single payment- Discount- Installment- Credit card- Debt consolidation- Education loans- Interest-simple and compound- Bankruptcy |
| 3. Other Services | <ul style="list-style-type: none">- Safety deposit box- Travellers cheques- Government bonds- Short term certificates and deposits- Senior citizen services |
| 4. Banks | <ul style="list-style-type: none">- Bank of Canada - role- Chartered banks - role, service- Provincial type banks- Credit Unions |

Supplementary Resources:

- Royal Bank Education Kit - Your Money Matters.
- Alberta Consumer and Corporate Affairs has pamphlets, (Tip sheets), film clips regarding the section on loans.
- Attempt to make use of resource people within the community. (Credit Union, Banks, Trust Companies, etc.)

Text References:

Math In Life

- various topics throughout text.

Math Plus

- parts of Units 4,5 and 6.

Personal Salaries and Operating Costs (Mathematics 15)

| <u>TOPICS</u> | <u>SUBTOPICS (areas of application)</u> |
|--|--|
| 1. Personal Income (wage earner or self-employed) | <ul style="list-style-type: none">- Hourly wages- Salary - annual or monthly income- Commissions- Income tax (a major unit within Math 25)- Pension premiums- Medical insurance- Unemployment insurance- Others |
| Deductions | |
| 2. Home Ownership Costs (house, apartment, condominium) | <ul style="list-style-type: none">- Mortgage payments- Utility costs - heat, power, water, telephone, television, etc.- Improvement costs- Insurance- Furnishings |
| 3. Rental (home or apartment) | <ul style="list-style-type: none">- Comparative costs- Size, location, lease contracts- Comparison to ownership- Furnishings- Insurances- Utility costs- Others |

Texts:

Math In Life - various topics throughout text.

Math Plus - Unit 4 - Earnings.

Supplementary Resources:

Pamphlets available from Alberta Consumer and Corporate Affairs.

The Automobile (Mathematics 15)

| <u>TOPICS</u> | <u>SUBTOPICS (areas_of application)</u> |
|----------------------------|---|
| 1. Operating an automobile | <ul style="list-style-type: none">- New or used - initial cost- Loan plans- Insurance- Maintenance costs - operating expenses- Depreciation- License- Leasing- Fuel Consumption versus speed |
| 2. Other items | <ul style="list-style-type: none">- Appreciation of cars (antique)- Leasing versus owning- Public transit versus driving- Fines and other costs involved in driving offences- Pollution- Brakes - types and effectiveness- Tires - cost and effectiveness |

Texts:

Math in Life - Fuel Costs pp. 34-35
- Borrowing Money to Buy A Car pp. 98-99

Math Plus - Car loans pp. 154-155
- Insurance pp. 180-183

Supplementary Resources:

Buying a Used Car (Kit containing 12 minute film, teaching guide, duplicating masters - available on loan from Alberta Consumer & Corporate Affairs).

Alberta Automobile Wholesale Guide (Blackbook).

Tipsheets from Alberta Consumer & Corporate Affairs.

Budgeting (Mathematics 15)

| <u>TOPICS</u> | <u>SUBTOPICS (areas of application)</u> |
|---------------------------------------|--|
| 1. Pricing Goods | <ul style="list-style-type: none">- Comparison shopping, Canadian versus foreign items- Using the newspaper- Timing of sales- Seasonal buying- Bulk buying |
| 2. Consumer Tips - Laws for Consumers | <ul style="list-style-type: none">- See Consumer Affairs |
| 3. Market Surveys | <ul style="list-style-type: none">- Radio reports- T.V. programs- Government reports |
| 4. Installment Purchases | <ul style="list-style-type: none">- i.e., automobile, furniture and appliances- Finance charges (simple interest rates)- Monthly payments |
| 5. Charge Accounts | <ul style="list-style-type: none">- Types - credit cards and accounts- Credit limits- Minimum payment- Statements- Finance charges (cost of credits) |
| 6. Discounts | <ul style="list-style-type: none">- Cash- Trade- Chain |
| 7. Sales Tax | <ul style="list-style-type: none">- Provincial responsibility and purpose |

TOPICS

SUBTOPICS (areas of application)

- | | |
|-----------------------|---|
| 8. Flexible Budgeting | - Fixed expenses, flexible expenses - Saving |
| 9. Holidays | - See Travel and Recreation elective |

Supplementary Resources:

"The Complete Consumer" - Budgeting and Credit (Programs 10, 11, 12, 13, and 14) - 15 min., video

Program 10: "Rationale for Budgeting" (ACCESS Catalogue #210210)

Regardless of their specific lifestyles, most consumers are never quite sure where their money goes. The concept of planned spending and having an idea what this expenses will be, compared with the money they will have to cover these expenses, will help consumers use their money wisely and avoid some unpleasant shocks.

* Good introduction to budget planning unit.

Program 11: "The Mechanics of Budgeting" #210211)

Budgeting is not an exercise in when to stop spending money, but rather an exercise in where to spend it so that it will do the things you want. Future expenses that might only come up once a year need to be added to our regular monthly expenses to ensure that they won't come as a surprise.

Program 12: "Credit Use and Abuse" (ACCESS Catalogue #210212)

Credit - handle with care! Many people use credit wisely. They examine tomorrow, plan for it and fit their credit purchases into their plans. But credit can also be a way of spending tomorrow's money today. That means that you can have today what you can't afford until tomorrow... but what will you do tomorrow?

* Use in conjunction with the "Before You Go Under Guide" and film excerpts.

Program 13: "Types of Credit" (ACCESS Catalogue #210213)

The question we often hear when shopping, "Will that be cash or charge?" has many implications. The differences in interest rates, monthly payments and the length of the repayment plan are discussed. The consumer is encouraged to do some comparison shopping, as the services of credit should be treated like any other product.

* Good for simulation exercises for purchases and shopping for loans.

Program 14: "Contracts" (ACCESS Catalogue #210214)

Most contracts are fulfilled without any problems. The two parties involved understand each other and everything works out as they expected. It's when everything doesn't work out that trouble starts. This program discusses the various parts of a contract, and outlines a procedure that can be followed to ensure that problems are avoided in future agreements.

(Dubs of the programs can be ordered from the Media Resources Centre of Access, 16111 - 29 Street, N.W., Calgary, Alberta, T2N 4J8).

Additional material is also available from Alberta Consumer and Corporate Affairs, eg. Before You Go Under - A Self-help Financial Management Guide

Travel and Recreation (Mathematics 15)

TOPICS

SUBTOPICS (areas of application)

- | | |
|--|---|
| 1. Travel Bureaus | <ul style="list-style-type: none">- Functions- Travel packages- Seasonal differences- Budget plans |
| 2. Compare Travel Costs | <ul style="list-style-type: none">- Car, bus, air- Special seasonal rates- Eurail |
| 3. Living Expenses | <ul style="list-style-type: none">- Meals- Recreation costs, ie, Disney World- Purchases- Tips- Gifts- Medical insurance |
| 4. Money Exchange and Modes of Money Use | <ul style="list-style-type: none">- Traveller's cheques- Use of credit cards- Custom regulations |
| 5. Map Reading | <ul style="list-style-type: none">- City maps- Provincial and State routesBrochures, re: travel-tourists offices |

Text:

Math In Life

- throughout text

Supplementary Resources:

Material available from Alberta Consumer and Corporate Affairs (Tipsheet - Vacation Planning), Travel Alberta and local travel agencies

ELECTIVES — OTHER

Calculator Literacy (Mathematics 15)

| <u>TOPICS</u> | <u>SUBTOPICS (areas of application)</u> |
|--|--|
| 1. Mechanical Aspects of Various Calculators | <ul style="list-style-type: none">- Differences in power supply, automatic shut off- Differences in on/off switch location- Differences in keyboard lay out- Durability of construction and proper care of the instrument |
| 2. Capabilities | <ul style="list-style-type: none">- Basic operations (+, -, ×, ÷)- Basic operations with decimal numbers- Constant and memory features- Special function keys- Discuss other special function keys often available to science and commerce in special calculators |
| 3. Limitations | <ul style="list-style-type: none">- Recognize: digit capacity, overflow, "error", correction- Type of functions: scientific, commerce- Arithmetic limits: e.g. $(1/3 \times 3)$ is not 1 using a calculator- Limits of simple calculators in handling masses of data- Complex computations, large number of repetitions |
| 4. Calculator Errors | <ul style="list-style-type: none">- Errors in reading and keying in data and operations- Errors in reading output and display |

TOPICS

SUBTOPICS (areas of applications)

5. When to Use

- Experience a broad range of use in a variety of computational and problem solving situations
- Use calculators in appropriate situations. Recognize and classify computational situations: e.g. (a) memorized number fact, (b) mental arithmetic, (c) pencil and paper arithmetic, (d) simple four-function calculator, (e) multi-function or programmable calculator (f) computer

Calculator Literacy Elective

Immerzeel, G. and Ockenga, E., Calculator Activities for the Classroom, Book 2, Creative Publications Inc., Palo Alto, California 1977

- Available from Setsco

National Council of Teachers of Mathematics Calculator Materials

- "Learning to Use Your Calculator" by Immerzeel C. and Ockenga, E.
- "Problem Solving Using the Calculator Book II"

Useful Calculator Resources For Both Core and Elective Components of Math 15

NCTM Materials:

- "Key Ideas for the File" by Immerzeel, G. and Ockenga, E., (Junior High)

Vervoort, G., and Mason, D.J., "Intermediate Calculator Math, Fearon Pitman Publishers Inc., Belmont, California, 1980

Vervoort, G., and Mason, D.J., "Advanced Calculator Math, Fearon Pitman Publishers, Inc., Belmont, California, 1980

History of Measurement (Mathematics 15)

| <u>TOPICS</u> | <u>SUBTOPICS (areas of application)</u> |
|--------------------------------------|--|
| 1. The Need For Measurement | <ul style="list-style-type: none"> - Primitive Man (Choosing club of sufficient size and weight, selecting an animal hide or adequate size, etc.) - Organized Societies - trade and commerce - Standardized Units |
| 2. Ancient Systems of Measurement | <ul style="list-style-type: none"> - Egyptian Measure - Greek Measure - Roman Measure |
| 3. History of the English System | <ul style="list-style-type: none"> - Influence of the Greeks, Romans and Scandinavians - Imperial Measure - American Measure |
| 4. History of the Metric System | <ul style="list-style-type: none"> - Mathematical and Scientific Development (18th Century French Scientists) |
| 5. Le Système International d'Unités | <ul style="list-style-type: none"> - Refinement and Extension of the Metric System - Increasing World Use of SI |

Resources

- 1) Black, G.J., "Canada Goes Metric" Doubleday Canada Ltd., Toronto, Ontario, 1974
- 2) Singer Education & Training Products, "English or Metric?" "That is the Question", Clearvue Inc., Chicago (set of 4 filmstrips and cassette tapes, two of the filmstrips are entitled "History of the Metric System" and "History of the English System")
 - approximate cost \$10.00 per filmstrip, \$8.00 for the cassette or record
 - available from Education Film Distributors Ltd., 285 Lesmill Road, Don Mills, Ontario, M3B 2V1

Computer Literacy (Mathematics 15)

TOPICS

SUBTOPICS (areas of application)

1. History of Computing
2. How Computers Work
 - Structure of computer systems
 - Functions of 5 major parts
3. Control of Computers
 - Communication with computers
 - How to instruct computers
4. What Computers Can and Cannot Do
 - Capabilities and limitations
 - Misconceptions of Computers
5. Characteristics of Computers
 - Speed, accuracy, and tireless and need to be instructed
6. Effect of Computers on Society
 - Impact on individual groups, the economy, education, jobs, crime, etc.
 - Benefits and dangers of computerization
7. Application of Computers
 - Uses in Business, Government, Science, Education, etc.,
 - Computer careers
8. Computers and the Future
9. Microcomputer Operation (For those schools with machines available)
 - Canned games and simulation programs
 - Familiarization with the communication process
10. Introductory Programming

NOTE: These topics for computer literacy are fairly comprehensive; any one or more of the topics may be chosen. It is not expected that the total literacy elective be attempted.

Ideas for the above topics were adopted from Monitor, November, 1979

Resources

Rice, Jean, "My Friend - The Computer", T.S. Denison and Co. Inc.,
5100 W - 82 Street, Minneapolis, Minn., 55437, 1976.
- student and teacher edition.

Johnson, David C.; "Computer Literacy - What Is It?", The
Mathematics Teacher, February, 1980, Vol., 73, No.2 (Teacher
Reference).

Shelly, G.B. and Cashman, T.J., Introduction to Computers, and
Data Processing, Anaheim Pub. Co., 1120 E. Ash, Fullerton, CA
92631, 1980 (Teacher Reference)

Pythagorean Theorem and Similar Triangles

(Mathematics 15)

TOPICS

SUBTOPICS (areas of application)

- | | |
|------------------------|--|
| 1. Pythagorean Theorem | - Right triangle - Reading tables - Practical problems |
| 2. Similar Triangles | - Finding missing sides - Practical problems (finding heights, distances, etc.) |

Resources for Pythagorean Theorem

Mathematics Plus - (pages 40-41)

Mathematics in Life - (pages 364-367, 376-379)

Resources for Similar Triangles

Math In Life - (pages 202-203, 206-207)

Graphing on a Co-ordinated Grid (Mathematics 15)

TOPICS

SUBTOPICS (areas of application)

- | | |
|---------------------------------|--|
| 1. Locating Points on a Grid | <ul style="list-style-type: none">- City Maps- Battleship |
| 2. Coordinates as Ordered Pairs | |
| 3. Cartesian Coordinate Plane | <ul style="list-style-type: none">- x-axis, y-axis, origin- locating points on the plane- reading coordinates from the plane |

RESOURCES

Math In Life - Chapter 15 - Graphing

Math Plus - Unit 12 - Graphing Points and Lines

STRATEGIES OF PROBLEM SOLVING

In the teaching/learning of problem-solving, an instructional approach should be used which helps students learn and choose procedures for solving problems. These procedures are easy to state and recognize, but they are often quite elusive when teaching. Difficulty frequently exists when teaching problem solving because, unlike the teaching of computational skills, or concepts, there is no specific content involved. In problem solving, an individually acquired set of processes is brought to bear on a situation that confronts the individual.

There are generally four procedures (steps) which appear inherent in problem solving. These procedures, their descriptions and associated strategies have been compiled and adapted from a variety of sources and authors (George Polya, J.F. LeBlanc, Ohio Department of Education, Math Resource Project, 1980, NCTM Yearbook) and are listed below:

STEPS IN PROBLEM SOLVING

1) UNDERSTAND THE PROBLEM

What is the problem? What are you trying to find? What is happening? What are you asked to do?

Suggested Strategies:

- Paraphrase the problem or question (Restate the problem in your own words to internalize what the problem entails.)
- Identify wanted, given and needed information (Helps students focus on what is yet to be determined from problem statement as well as listing information so that they may better be able to discover a relationship between what is known and what is required.)
- Make a drawing (May help to depict the information of a problem, especially situations involving geometric ideas.)
- Act it out (Helps to picture how the problem actions occur and how they are related thereby giving a better understanding of the problem.)
- Check for hidden assumptions (What precisely does the problem say or not say? Are you assuming something that may not be implied? Beware of mistaken inferences.)

2) DEVISE A PLAN TO SOLVE THE PROBLEM

What operations should you use? What do you need to do to solve the problem? How can you obtain more information or data to seek the solution?

Suggested Strategies:

- Solve a simpler (or similar) problem (Momentarily set aside the original problem to work on a simpler or similar case. Hopefully the relationship of the simpler problem will point to the solution for the original problem.)
- Construct a table (Organizing data in tabular form makes it easier to establish patterns and to identify information which is missing.)
- Look for a pattern or trend (Does a pattern continue or exist? In connection with the use of a table, graph, etc., patterns or trends may be more apparent.)
- Solve part of the problem (Sometimes a series of actions each dependent upon the preceding one, is required to reach a solution. Similarly it may be that certain initial actions will either produce a solution or uncover additional information to simplify the task of solving the problem.)
- Make a graph or numberline (May help organize information in such a way that it makes the relationship between given information and desired solution more apparent.)
- Make a diagram or model (When using the model strategy attempt to select objects or actions to model those from the actual problem that represents the situation accurately and enables you to relate the simplified problem to the actual problem. May be used in connection with, or in place of other similar strategies, i.e., acting out the problem.)
- Guess and check (Guessing for a solution should not be associated with aimless casting about for an answer. The key element to this strategy is the "and check" when the problem solver checks his guesses against the problem conditions to determine how to improve his guess. This process is repeated until the answer appears reasonable. An advantage of this "guess and check" strategy is that it gets the individual involved in finding a solution by establishing a starting point from which he can progress. Used constructively with a table or graph this strategy may be a valuable tool.)

- Work backwards (Frequently, problems are posed in which the final conditions of an action are given and a condition is asked for which occurred earlier, or which caused the final outcome. Under these circumstances working backwards may be valuable.)
- Change your point of view (Some problems require a different point of view to be taken. Often one tends to have a "mind set" or certain perspective of the problem which creates a difficulty in discovering a solution. Frequently, if the first plan adopted is not successful, the tendency is to return to the same point of view and adopt a new plan. This may be productive, but might also result in continuous failure to obtain a solution. Attempt to discard previous notions of the problem and try to redefine the problem in a completely different way.)
- Write an open sentence or equation (Often in conjunction with other strategies - using a table, diagram, etc., one selects appropriate notation and attempts to represent a relationship between given and sought information in an open sentence.)

3) CARRY OUT THE PLAN

For some students the strategy/strategies selected may not lend itself/themselves to a solution. If the plan does not work, the problem solver should revise the plan, review step 1, and/or try another plan or combination of plans from step 2.

4) LOOK BACK AT THE STEPS TAKEN (Consolidating Gains)

Is the result reasonable and correct? Is there another method of solution? Is there another solution? Is obtaining the answer the end of the problem?

- Generalize (Obtaining an answer is not necessarily the end of a problem. Re-examination of the problem, the result and the way it was obtained will frequently generate insights far more significant than the answer to the specific situation. It may enable the student to solve whole classes of similar and even more difficult problems.)

- Check the solution (The very length of a problem or the fact that symbolic notation is used may tend to make one lose sight of the original problem. Does the answer appear reasonable, does it satisfy all the problem requirements.)
- Find another way to solve it (Can you find a better way to confront and deal with the problem? The goal of problem solving is to study the processes that lead to solutions of problems. Once a solution is discovered, search the problem for further insights and unsuspected ideas and relationships.)
- Find another solution (Students tend to approach many problem situations with the expectation of only one correct solution. In many practical, daily life situations there may be many answers that are correct and acceptable.)
- Study the solution process (Studying the process of solution makes the activity of problem solving more than answer-getting and can expand an individual problem into a meaningful total view of a family of related problems.)

It must be noted that the 4 steps of the above model are not necessarily discreet. For example, one may move without notice into step 2 while attempting to generate more information to understand the problem better.

If the 4-step model is used, the key is to select an appropriate strategy or strategies to help answer the questions suggested by each step. The strategies listed, and those devised by students will hopefully alter the problem information, organize it, expand it, and make it more easily understood. Strategies then may be thought of as the tools of problem solving and the 4-step model, the blueprint.

QA 14 C22 A3 A29212 1981
ALBERTA ALBERTA EDUCATION
MATHEMATICS 15

39841021 CURR HIST



DATE DUE SLIP

[illegible]

QA 14 C22 A3 A29212 1981
Alberta. Alberta Education.
Mathematics 15 :

3984 1021 CURR HIST

CURRICULUM GUIDE

For Reference

NOT TO BE TAKEN FROM THIS ROOM

EXCEPT WITH LIBRARIAN'S PERMISSION

